THE HILSA FISHERY OF THE CHILKA LAKE[1]

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(With 2 plates, 3 graphs and 3 text figures)

INTRODUCTION

During the fisheries investigations in the Chilka Lake (Fig. 1), from where the city of Calcutta draws an appreciable part of its fish supply,

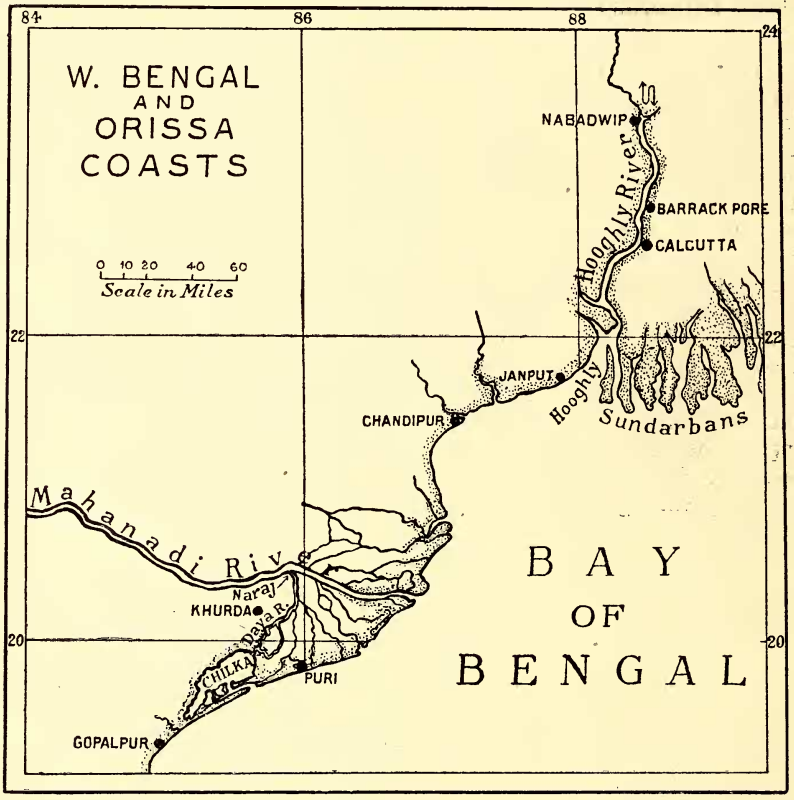

Fig. 1. West Bengal and Orissa coasts, showing the Chilka Lake and other centres of observation. The arrow indicates the position of the Naraj Anicut.

certain observations were made on the biology and fishery of the Indian Shad, *Hilsa ilisha* (Hamilton), which are detailed below. According to

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the figures collected by the Orissa Fisheries Department, 3443 maunds[1] of fresh hilsa fish were exported by rail in the year 1948 and 1255 maunds in 1949, out of the total export of 71,400 maunds and 61,100 maunds of fresh fish during the respective years.

In view of the low economic standard of the local people and the high price obtained for the fish at Calcutta, almost the entire catches of hilsa are exported, and thus the above figures represent over 95% of the hilsa yield from the lake for these years. The available statistics show considerable variations in exports from month to month in different years, on account of great fluctuations in the catches from the lake, and it is necessary to study the statistics for a number of years to be able to explain the cause for fluctuations in the fishery.

The Chilka is a large brackish-water lake, in the deltaic region of the Mahanadi, extending over an area of about 450 square miles during the monsoons and about 350 square miles for the rest of the year. In the east, it is connected to the Bay of Bengal by means of a narrow bent channel, about 14 miles long and in the northern section it receives flood waters from the Daya, a branch of the Mahanadi. The lake is very shallow, except in the southern sector, where it is somewhat deep. The fish fauna, which is mainly estuarine in composition, gets continuously replenished from the sea and its consequent elements at any one time largely depend on the salinity and other general hydrological conditions which vary from season to season, both in the lake and the channel. In the summer, the main area of the lake is distinctly brackish, whereas at the end of the monsoons a great part of it is fresh and the change from the water of low to that of comparatively high salinity takes place by the ingress of sea water through the channel. The hydrological conditions in the lake are mainly influenced by the flood waters of the Daya. Lying north-east close to the lake is a chain of hills which leaves only a narrow stretch of catchment area, giving rise to a very few small streams that drain into the lake during rains. The effect of the local rainfall thus being not appreciable, the cyclic change from brackish to fresh water in the lake depends almost entirely upon the flow from the Daya, as the flood waters not only check the ingress of sea water through the channel but also gradually push out the brackish water and the Chilka becomes a fresh water lake.

Fishery

Hilsa is fished in the Chilka throughout the year and the figures shown in the tables I and II throw some light on the relative abundance of the fish in the different parts of the lake. Though the catch is dependent on various factors and the occurrence of the fish near the different centres may not necessarily be proportionate to the export figures recorded from those centres, it is obvious that the fish does not occur in appreciable quantities in the southern sector, i.e. south of Balugan where the salinity is generally higher, and is available in greater abundance in the northern section, i.e. towards Kaluparaghat side. In the ordinary course, the fish is exported

[1] 1 Maund=82.28 lb.

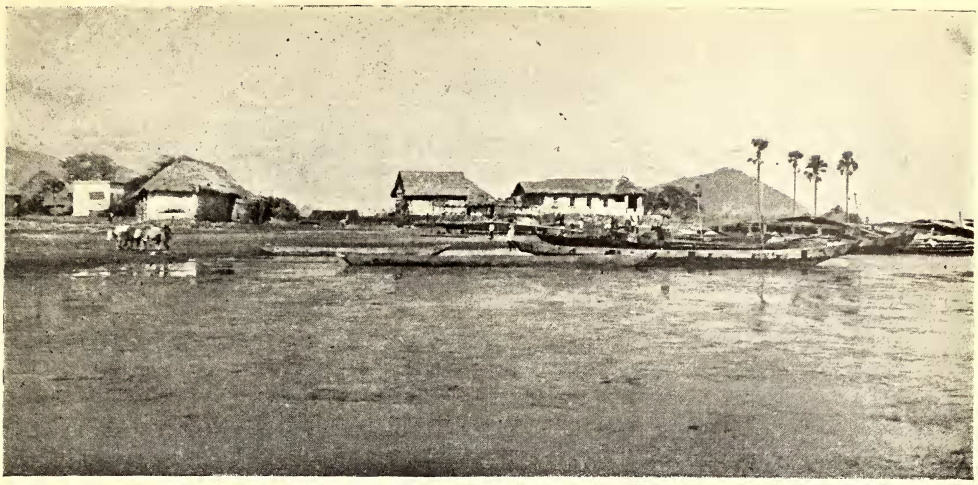
from the centre nearest the fishing ground and as such generally the fish caught near Parikud and between Parikud and Satpara is exported from Balugan [Plate 1 (1)]. The catches from the Satpara side are however exported from Balugan as well as Kaluparaghat, as both the centres are more or less equidistant, whereas, most of the catches from Tuaside and beyond in the north, are diverted to Kaluparaghat. Exports from Gangadharpur and Kuhuri consist mainly of the catches round about these centres, though occasionally some catches from Gangadharpur are diverted to Balugan also. In the bay near Rambha and Kallikhota, there is not much of hilsa and the catches are exported from the nearest centre.

Fishing methods. Gilling nets are used for the purpose of catching hilsa by encircling, and these are locally known as 'Bhid Jal', 'Garoa Jal' and 'Patua Jal' [Plate 1, (2 and 3)]. Strictly speaking 'Patua Jal' is not operated as a means for catching hilsa, but accidentally the fish gets caught in the net, when the latter is operated for catching 'Patua' (Engraulid) fish.

Fish trade. As the fish fetches fairly high price outside the province, it is rarely salted and that also only in the remote fishing centres, from where it is difficult to transport it to the exporting centres in time. At times lack of ice and persistent bad weather, specially in the monsoon season, necessitate the salting of the fish, but otherwise the fishermen export it through co-operative societies [Plate II (1)] or merchants who hold permits for export outside the State of Orissa. Fish is packed in bamboo baskets [Plate II (2 & 3)] one maund in each, with about a maund of well-crushed ice. An advance against the weight of the catches tendered for sale, upto the Civil Supplies rate of Rs. 32 per maund of 40 seers is paid to the fishermen, if required, at the time of delivery, and the account is finally settled on the basis of the 'chalans' received from the market where the fish is auctioned or otherwise disposed of. A deduction of about Rs. 16 per basket of one maund of fish is made from the rate shown in the 'chalan' towards export duty, transport, cost of ice and other incidental charges. For the fish exported to Calcutta, the fishermen get roughly Rs. 45 to Rs. 50 per maund, though the sale price there generally varies between Rs. 80 and Rs. 100. It may be mentioned here that the Chilka hilsa fetches a lower price than the Ganges hilsa, which is received in better condition and consequently is in greater demand.

Seasonal Fluctuations and Crop Movements in Relation to Physico-Chemical Changes

The export figures for 1948 and 1949 given in tables I and II, which are very nearly equivalent to the catches from the lake in these years, as there was no difference in the fishing conditions or the local demand, indicate the presence of two peak periods, which obviously correspond to two main waves of migration of fish (Graph I) into the lake, one at the close of the winter and the other at the commencement of the monsoons. In the Hooghly also there are two periods of migration, one by about February, i.e. at the close of the winter, and the other with the onset of the monsoons. Though statistics of



(1) A view of Balugan, one of the main fish assembling and exporting centers in the Chilka. Fish is being unloaded from the country boats seen in the foreground

(2) A view of the gilling nets in operation, in which hilsa is caught.

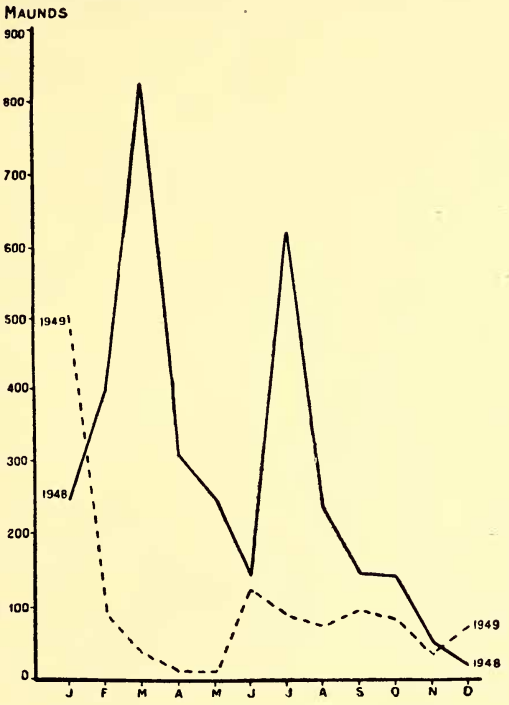
(3) Stacking the net in boats and collecting the gilled fish as they come in.

(1) A view of the Ambica Fishermen's Co-operative Society, Balugan, with their offices in the background and fish godown in the foreground, where a large number of hilsa specimens were examined. Carts parked near the godown contain ice blocks in gunny bags.

(2) A view of the baskets in which hilsa and other fishes are packed and

(3) A view of the interior of one of the godowns, where weighing and packing of fish are in progress.

catches for the Hooghly are wanting, general observations indicate, that the ascent during the floods is of considerable magnitude compared to the earlier one, while in the Chilka, it can be seen from the figures,

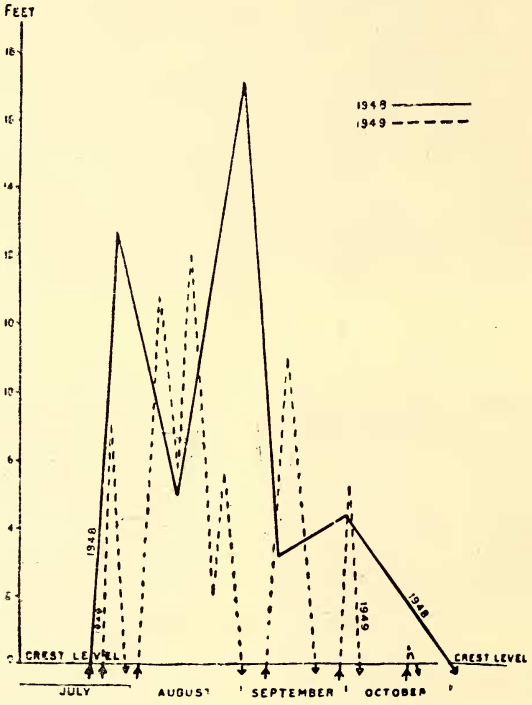


Graph I. Showing export of fresh hilsa from the Chilka Lake in the years 1948 and 1949.

that the late winter or the early spring migration is of equal, if not greater, intensity.

As the statistics of export show, the hilsa catches were higher in 1948 than in 1949 and enquiries made among fish merchants and fishermen reveal that catches in 1949 were distinctly lower than during the past few years, in spite of the fact that the intensity of fishing was the same. Though it is premature to attribute this decline to any particular cause, a tentative explanation may be offered. A study of the flood level over the Naraj Anicut and the rainfall in the Chilka region indicates that both the flood level and the rainfall were less in 1949 than in the previous year as is shown by the graphs II and III, and table 3. The rainfall at Puri, Gopalpur and Khurda in 1948 was 50.77, 36.89, and 55.62 inches respectively, and in 1949, 52.57, 37.15, and 33.41 inches respectively. Though the rainfall at Puri and Gopalpur, i.e. along the coast was more in 1949 than in 1948, the case was reverse at Khurda, that is to say in the hinterland where the rainfall was about two-thirds of the previous years'. Obviously it is the rainfall in the hinterland which influences the flood levels in the

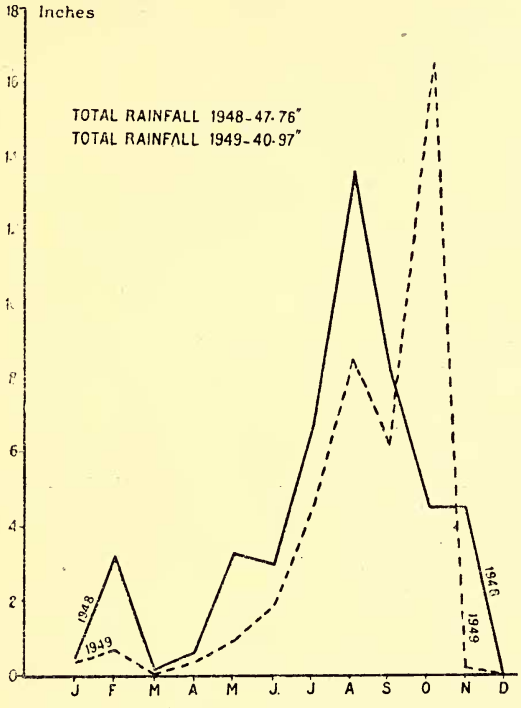
Mahanadi and the subsequent flow in the Daya, which in turn causes changes in the hydrological conditions in the northern sector of the lake and thus influences the fishery. The following comparative rainfall figures also confirm the above view. The rainfall at Puri, Gopalpur and Khurda in October 1948 was 4.51, 3.83 and 5.24 inches respectively,



Graph II. Showing rainfall over the Chilka region in the years 1948 and 1949. (Average of Gopalpur, Khurda and Puri.)

and in October 1949, 21.69, 20.46 and 7.51 respectively, which means along the coast it was nearly three times more than at Khurda which is towards the interior, but still there was practically no rise over the crest level of the anicut. On the other hand due to high rainfall in the interior in 1948, the flow over the crest level was substantial and steady even in October 1948, though the rainfall during that month in the coastal area was less than in the corresponding month of the following year. As regards rainfall along the coast, when it is substantial, it probably creates conditions which result in congregaton of sholas in the coastal waters and this may account for the heavy catch along the Puri coast in September 1949 as stated elsewhere in this paper. It could therefore reasonably be presumed that in 1949 the flow of water from the lake into the sea, might not have been sufficient to stimulate large numbers of spawning fish to react against the current and thus ascend from the coastal waters to the lake. In this connection a similar observation recorded by Chacko and Dixithulu (1951) on the hilsa in the Godavari, that owing to the fall in the flood levels

and the silting up of the river, the hilsa shoals did not enter the Godavari, but migrated towards the north and contributed an 'unusual sea fishery of considerable magnitude' at Kakinada (Coconada) about 50 miles away lends support to the above view, and it will be interesting to conduct investigations on the above lines for the Godavari



Graph III. Showing trend (i.e. continuous rise or fall) of flood levels in the Kathjuri (branch of the Mahanadi), over the crest level of the Naraj Anicut in the years 1948 and 1949.

region also. The abundance of the hilsa fishery thus seems to be dependent on a combination of factors, as in the case of the American Shad, for the migratory movements of which, according to Leach (1925), freshets, unusual turbidity of water, and the direction and the velocity of the wind, all are influential factors.

In order to study the movements of the fish, investigations were made to find out whether the fish is a permanent inhabitant of the lake and breeds there, or whether it comes from the direction of the sea, and if so where it breeds. Elucidation of these points is likely to be helpful for formulating conservancy measures required if any, for this important fishery. There is no data available on the bionomics of the Chilka hilsa except the remark by Chaudhuri (1917) that the fish occurs throughout the year though 'it must remain doubtful if the species breeds there'. A general study of the distribution of the fish shows their comparative abundance in the northern section of the

lake, where the salinity is always lower on account of the influx of water during the rains from the Daya, one of the deltaic branches of the Mahanadi River[1]. The salinity and the general hydrological conditions in the lake, which have a profound effect on fish life, however, vary from season to season.

In the case of the American Shad, *Alosa sapidisima*, it is said that its movements are largely controlled by the water temperature and that 'it is believed, that it seeks to occupy an area having a temperature of 60 or 70 degrees, and that its migrations are determined by the shifting of this area'. (Leach 1925, p. 465). The influence of temperature on the movements of the Indian shad is not known, but our observations regarding catches at Barrackpore show that the fish react to the variations in the temperature, showing very restricted migratory movements during the cold season. In February 1950, when the first wave of migration commenced, hilsa was found in the catches near Barrackpore and it was breeding also in the Hooghly. Later on there was a spell of cold wave from 12-2-50 to 16-2-50 and very few fish were reported in the catches and breeding activity was also considerably restricted. In the coastal waters, however, fluctuations in temperature should be more frequent than in the open sea, and are to a very great extent influenced by currents, winds and tides.

The actual movement of the fish from the sea into the lake and *vice versa* could not be studied, but results of local enquiries indicate that large shoals generally come from the direction of the sea along the channel of the lake by February, (January to March), when the fish is caught in appreciable numbers. In September 1949, there was an unusually heavy catch of hilsa from the sea at Puri, and this goes to indicate the presence of hilsa in the coastal waters, in the neighbourhood of the Chilka.

Regarding the seaward movement of the fish no information is available, but judging from the fishing conditions it may not be wrong to presume that intensive fishing in the shallow waters of the lake spares very few spent adults to perform the return journey and as such, movement of the stragglers if any, could not be conspicuous enough to receive attention. Prompted by the spawning urge, the breeders ascend the rivers and the spent fish drift with the flowing waters and the young also start on their gradual seaward movement. In the Hooghly the young hilsa move to the lower regions of the estuary, but the movement of the young from the Chilka to the sea is not known, as no nets similar to 'Bhin-Jals' or 'Dhara Jals' which are so common in the Hooghly and at Chandipore, are operated in the channel and its neighbourhood, and as such the young are rarely caught.

Size Groups and Sexes

During the course of the investigations an attempt was made to determine as far as possible the size groups, the rate of growth and ratio

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[1] For general information regarding the hydrography of the lake see *Mem. Indian Mus.*, 5 (1): 5-12.

of sexes of the fish in catches and to interpret the same statistically, and accordingly from August, 1948, onwards, samples were collected from time to time, from fish godowns at various exporting centres, for the purpose of detailed examination. The observations were continued for over a year, during which period 1762 specimens as detailed below were examined.

SIZES AND SEX RATIO OF THE SPECIMENS EXAMINED

MONTH	Number of Hilsa specimens examined				Combined range		Male range		Female range	
	M	F	X	T	A	B	A	B	A	B
1948—										
August ...	139	188	14	341	506	134	457	191	506	198
September ...	188	98	39	325	520	208	449	208	520	229
October ...	3	36	—	39	485	257	353	269	485	257
November ...	17	12	150	179	485	213	485	244	483	294
December ...	32	7	574	613	480	84	431	216	480	317
1949—										
January ...	—	—	25	25	434	94	—	—	—	—
February ...	—	—	6	6	408	307	—	—	—	—
March ...	28	12	7	47	383	198	383	227	300	265
April ...	2	2	1	5	325	206	315	250	325	308
May ...	12	11	10	33	470	266	382	266	470	272
June ...	13	11	1	25	463	230	380	230	463	305
July ...	20	6	—	26	384	233	376	308	384	233
August ...	21	25	—	46	435	221	383	221	435	231
September ...	10	20	—	30	418	247	408	247	418	264
November ...	10	11	1	22	385	246	314	246	385	251

M = Males. F = Females. X = Unidentified sex. T = Total. A = Maximum length. B = Minimum length. Length is indicated in mm.

It was found that under the existing conditions, samples conforming to the standard of truly representative and random samples, which could yield reliable information about larger bulk of the population were difficult to obtain. Besides, a number of specimens which on applying pressure gave no indication of their sex, specially in November and December 1948, but from their size appeared to be either immature or spent fish, could not be cut open to ascertain the nature of their sex. Thus the observations had to be based only on those individuals which were definitely identified by pressing and a few which could possibly be cut open and the data tabulated shows that the proportion of the males to the females in the catches is not constant as has already been observed by Southwell and Prashad (1918).

BIONOMICS

Examination of a large number of specimens showed that the gonads were in ripe condition from August to October with September-October as peak period both in 1948 and 1949. Spent hilsa were collected from November onwards in 1948 and sexually mature fish

were rather rare thereafter till July-August of the next year, and a regular extended breeding season did not appear to exist as in the Hooghly hilsa (Hora and Nair 1940 a). A specimen measuring 47 mm. was obtained at Balugan towards the end of October, 1948, and young hilsa measuring from 84 mm. to 133 mm. began to appear in the catches along with other small clupeids in December 1948. Further, small specimens measuring about 110 mm. were found in the catches in April 1950. Analysing these size groups on the basis of observations made by Hora and Nair (1940) and Job (1941) on the young fish collected from the Pucca Settling Tanks of Pulta Water Works that the young fish grows roughly at an average rate of about 25 mm. a month and that ten months to a year old fish are just about a foot in length, it is possible to estimate that the breeding would have taken place by about August-September, if the fish grows at the same rate in open waters also, and thus the young specimens found in the catches in April 1950 might be the progeny of the late breeders.

Efforts were directed towards the location of the spawning grounds of the hilsa in the Chilka. Plankton collections made from the lake proper did not show any eggs or early larvae of the fish. It was felt that investigations in the northern section of the lake would yield interesting results in the location of the spawning grounds of the fish and with this object in view a systematic search was made near the mouth of the Daya, during the third week of September, 1949. On the afternoon of the 16th September, plankton collected from the river at Jagdala showed along with others, a certain type of lightly demersal eggs, and on the following morning drag net collections made from the neighbouring inundated areas of the lake showed the presence of young hilsa of about 32 mm. to 43 mm. On the next day, viz. 17-9-'49 at about 2-30 p.m. some three miles up the river, near the fishing village of Garasaguda, plankton collections from the river showed the presence of the eggs of the same type as mentioned above. They were in the early stage of development with the blastoderm as a cap of cells. The zona radiata was strikingly large and swelled up showing fine streaks on the surface and forming a double layering on preservation. The yolk was segmented as is the case in other clupeid eggs and there were several light yellow oil globules. The identity of the eggs was not clear at that time, but after working out the development of hilsa at Barrackpore, from the material collected from the Hooghly, (Jones and Menon 1950), it was possible to identify the material obtained from the Daya. At Garasaguda, along with the eggs postlarvae of hilsa (about 15 mm.) were collected, which is of significance, since it indicated the possibility of the fish breeding in the river. There was no fishing going on in the river at that time, but enquiries from the fishermen revealed that the fish goes up the river in large numbers when the latter is in floods. It could hence be said that the Chilka hilsa breeds in the lower reaches of the Daya, and probably in its associated branches also. How far up the river the fish breeds is difficult to say, but it is known to negotiate, during the heavy floods, the Naraj Anicut in the Kathjuri (from which the Daya branches off) and reach the Mahanadi. The ascent of the hilsa in the main Mahanadi river, which is spanned by the Cuttack Anicut, also takes place by about September, depending on the intensity of the floods.

During exceptionally heavy floods, hilsa is known to ascend as far as Sambalpur about 250 miles from the sea.

Food

The fish is essentially a plankton feeder. The oozing individuals do not appear to feed. There is no selective feeding as far as plankton is concerned. Copepods and diatoms have been found invariably to be the dominant items depending on their availability. Spent specimens have more of fine sand grains, showing more or less a sort of feeding habit at the bottom layers, while the young specimens appear to be mid-water feeders. The food of hilsa in the coastal waters has been given by Prashad, Hora and Nair (1940) and by Chacko and Ganapati (1949).

Coastal Fishery of Hilsa and its Bearing on Chilka Stocks

The hilsa fishery in the Chilka cannot be regarded as a detached and isolated one by itself as the crop is dependent on the stocks present in the adjacent coastal waters. Along the Orissa coast, as at Chandipur (Balasore) and Talpada hilsa move about in shoals and these are caught regularly from the inshore waters from the month of November. Towards the end of September 1950, large numbers of young hilsa measuring from about 38 mm. to 90 mm. were obtained by us from Chandipur and the older lot among these should be the progeny of the fish that bred towards the end of summer or the beginning of the monsoons, say May-June. Since collections from the same place, viz. Chandipur, during the previous months did not yield any stages of hilsa, it could reasonably be presumed that the fish has been breeding in some of the tidal stretches of rivers, as has been found in the Hooghly (Hora & Nair 1940 and Jones & Menon 1950 & 1951) and that the young are moving about in the coastal waters. In this connection the observations of Hora and Nair (1940 b) on the Jatka (young hilsa) fishery of East Bengal and the movements of hilsa in Sunderbans deserve special mention. The Jatka, two to five months old, feed in the estuaries and move about in shoals and though there is no definite evidence to show the actual direction of their movements, it is probable that they move from estuaries upstream and along the coastal waters. De (1910) refers to this upward movement and observes that the fish is found as high up as Goalundo in the Ganges from February to April. When exactly the first downward movement takes place is not stated. According to Howard (1938) 'the young fish after about two months' stay in the sea, add considerably to their size and weight, and towards the end of December they return to the estuaries (Sunderbans) in shoals. The fish at about this time are 7 to 9 inches long and in search of new feeding grounds'. Thus the presence of the young hilsa in the catches at Chandipur as stated above, and also at Janput along the Contai coast where specimens measuring about 50 mm. in total length were obtained in June 1949 (Jones & Menon 1951), lend support to the observations regarding the movement of the fish in coastal waters. The shoals of young hilsa

thus appear to wander about along the Bengal-Balasore coasts where the hydrological conditions are similar, but whether the sea in the

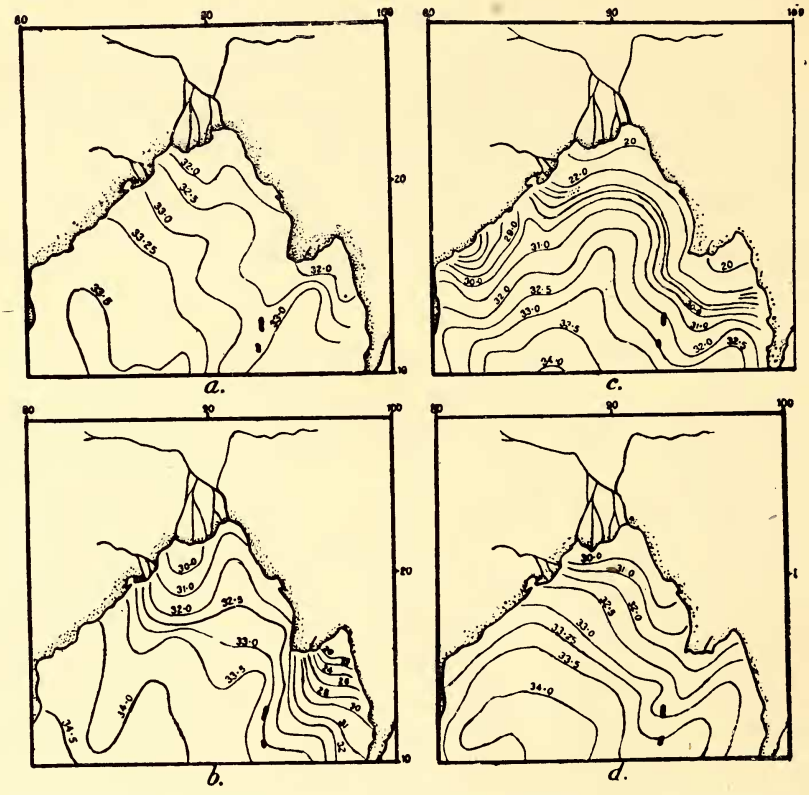

Fig. 2. Surface salinity of the Bay of Bengal (modified after Sewell): (*a*) from March to May; (*b*) from June to August; (*c*) from September to November; (*d*) from December to February.

neighbourhood of Chilka also comes within the orbit of their wanderings is yet to be ascertained. In winter months most of the adult fish fall back from the rivers to warmer waters of the estuaries, but with the advent of the hot weather they begin to show greater activity. While the mature fish react to the current and go against it like other anadromous fishes, this does not appear to be the case with the young, which have not been observed to travel against strong currents of flooded rivers. If the salinity, temperature and flow of the currents have anything to do with the movements of the fish, it will appear that the young fish in the tidal zone and the coastal waters is subject to a diversity of ecological conditions. The comparatively low salinity (Fig. 2), favourable direction of currents (Fig. 3), availability of food etc. may be contributing towards the presence of the hilsa in the coastal waters after the monsoons, and the various factors influencing the migrations require to be studied with special reference to the physiological requirements of the fish. In this connection influence of the salinity

of the coastal waters on the distribution of the Bombay-Duck, *Harpodon nehereus* (Ham.) pointed out by Hora (1934) is significant.

The currents in the sea indicate the net resultant movement of waters, inclusive of the effect if any, produced by the winds. Conditions are however different in the Chilka where similar currents are absent, tidal influence is not much specially in the main area, and the water is very shallow. The winds over the lake blow generally from the south-west from March to September and from north-

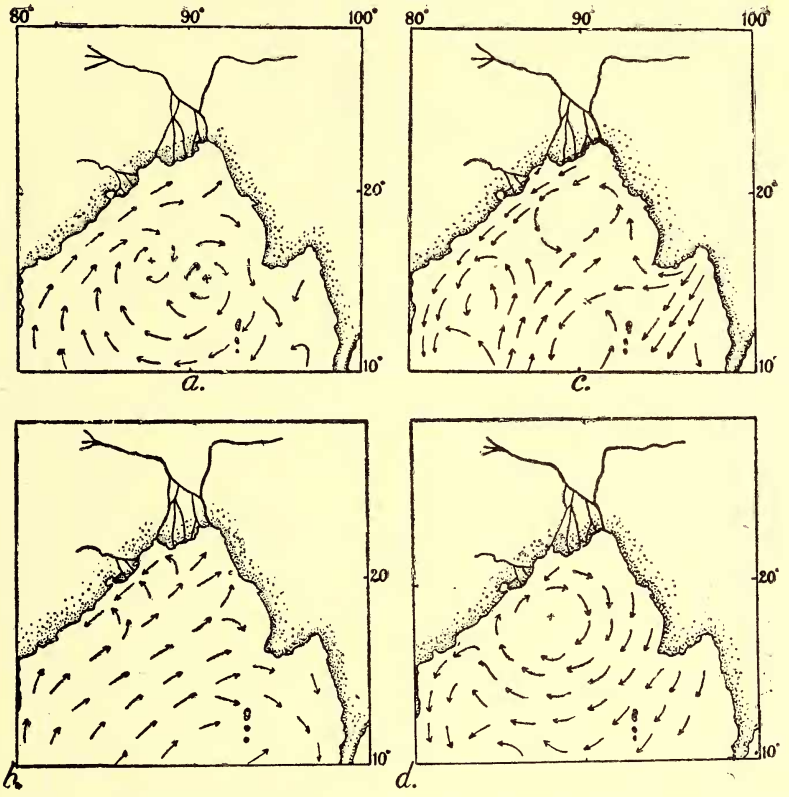

Fig. 3. Surface currents of the Bay of Bengal (modified after Sewell): (*a*) from March to May; (*b*) from June to August; (*c*) from September to November; (*d*) from December to February.

east in the remaining part of the year, that is to say opposite to the general direction of the currents in the sea. The meteorological data available for the years 1948 and 1949 for Puri and Gopalpur coasts indicate, that the average monthly wind velocity at these centres did not exceed the limits of the fresh breeze on the Beaufort scale and the maximum velocity at these centres, during the period, was 36 and 44 miles per hour respectively, that is to say it never exceeded the limits of strong gale, and was only of a few hours duration. Even moderate winds disturb the surface layer considerably and as such should affect the movements of the fish in the lake in view of its shallowness.

TABLE No. 1

Export of Hilsa from the Chilka in 1948 †

1948	Rambha	Kallikota	Balugan	Gangadhar-pur	Kuhuri *	Kalupara-ghat	Total
January	1 23 8	10 24 4	28 38 —	19 12 4		193 9 13	253 27 13
February		17 10 —	1 28 8	62 3 12		326 5 4	407 7 8
March		2 8 4	17 6 12	131 39 7		679 29 4	831 3 11
April		1 28 —	36 35 4	87 13 —		189 27 8	315 23 12
May			72 7 12	26 11 —		155 21 —	253 39 12
June			72 28 12	6 21 8	24 7 8	34 9 12	137 27 8
July			67 5 8	1 21 4	108 24 4	450 37 —	628 8 —
August	— 1 12		9 33 4	19 34 12	61 30 8	153 21 12	245 2 —
September		— 2 8	68 18 8	9 1 —	11 8 8	61 11 12	150 2 4
October	— 8 —		43 — 4	7 25 4	15 37 12	78 36 4	145 27 8
November	1 4 8		18 32 8	2 39 4	10 25 8	21 25 8	55 7 4
December	— 3 —	1 29 4	13 21 8	— 35 12	— 6 12	3 9 12	19 26 —
Total ...	3 — 12	33 22 4	450 16 8	375 18 3	232 20 12	2348 4 9	3443 3 0

† Statistics collected by the Orissa Fisheries Department.
Weight is recorded in maunds, seers and chataks.
* Kuhuri centre came into existence in June 1948.

TABLE No. 2

Export of Hilsa from the Chilka in 1949 †

1949	Rambha	Kallikota	Balugan	Gangadhar-pur	Kuhuri	Kalupara-ghat	Total
January	43 36 8	91 11 4	100 28 12	195 2 8	34 1 4	47 22 4	512 22 8
February	— — 8	5 14 —	— 20 8	14 29 12	31 — —	42 3 8	93 28 4
March		— 2 4	12 28 —	5 17 12	6 35 8	16 28 4	41 31 12
April			13 24 —	— 22 8	3 16 12	1 — 12	18 24 —
May	— 8 8		— 11 —	— 1 12	12 14 4	2 9 8	15 5 —
June			9 23 12		55 17 8	61 26 12	126 28 —
July			4 5 —	— 1 8	9 34 12	76 21 8	90 22 12
August			7 20 —	— 20 12	10 31 4	54 28 —	73 20 —
September			9 5 8	4 38 —	10 3 4	73 21 12	97 28 8
October			9 — 12	1 14 —	11 10 —	60 2 8	81 27 4
November	17 4 12	— 10 8	11 27 8	— 4 12	— 38 4	2 4 12	32 10 8
December	— 2 —	1 21 4	33 5 —	4 14 —		31 33 4	70 35 8
Total ...	61 12 4	98 19 4	211 39 12	227 7 4	186 2 12	470 2 12	1255 4 —

† Statistics collected by the Orissa Fisheries Department.
Weight is recorded in maunds, seers and chataks.

TABLE No. 3

Rainfall in inches at Puri, Gopalpur and Khurda

Year	Place	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Total
	Puri ...	0·19	3·76	—	0·01	2·71	5·03	10·13	12·79	8·66	4·51	2·98	—	50·77
1948	Gopalpur ...	0·04	3·51	0·11	0·27	3·44	0·59	5·05	9·71	5·58	3·83	4·76	—	36·89
	Khurda ...	0·92	2·24	0·02	1·34	3·65	3·25	4·97	18·05	10·07	5·24	5·87	—	55·62
	Average ...	0·38	3·17	0·04	0·54	3·27	2·96	6·72	13·52	8·10	4·53	4·54	—	47·76
	Puri ...	0·22	1·95	—	0·61	0·65	2·11	7·91	8·47	8·45	21·69	0·51	—	52·57
1949	Gopalpur ...	—	—	—	0·46	0·30	1·96	3·21	4·53	6·23	20·46	—	—	37·15
	Khurda ...	0·64	—	—	0·24	1·85	1·42	2·50	12·40	6·85	7·51	—	—	33·41
	Average ...	0·29	0·65	—	0·44	0·93	1·83	4·54	8·47	7·18	16·55	0·17	—	41·04